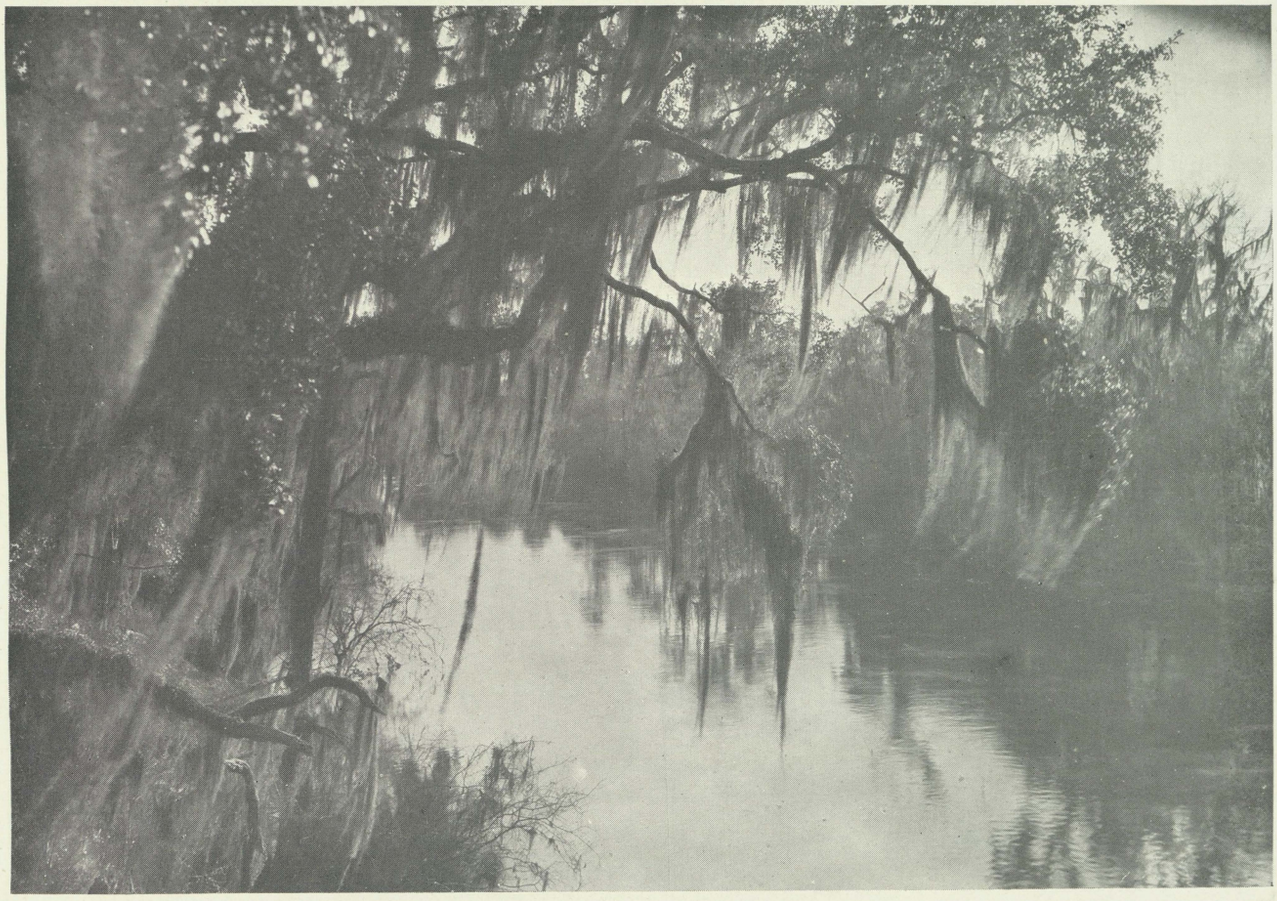
FLORIDA HIGHWAYS



"Way Down Upon De S'wannee Ribber"

Vol. III SEPTEMBER, 1926 No. 9

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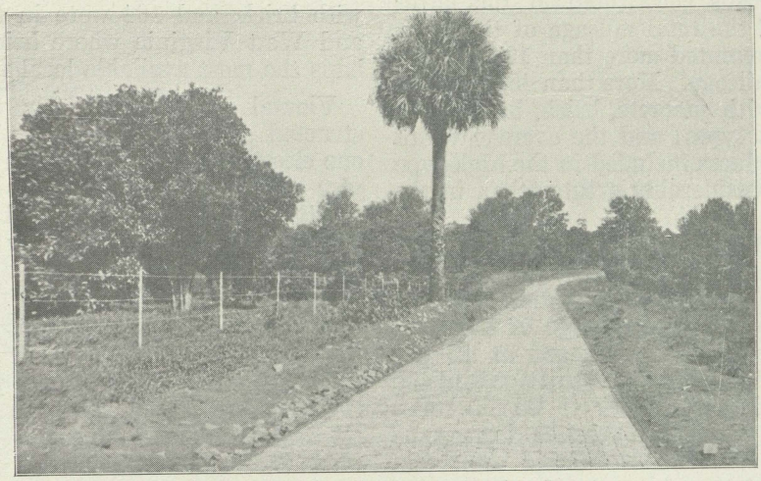
FLORIDA HIGHWAYS



Vol. III SEPTEMBER, 1926 No. 9

Development of Improved Highways

By Thomas H. MacDonald, Chief of Bureau, and H. B. Fairbank, Highway Engineer, U. S. Bureau of Public Roads, Washington, D. C.

(A paper read before the Western Society of Engineers, April 21, 1926.)

OF the 3,002,916 miles of highways of all classes in the United States, approximately 448,000 miles were improved with some form of surfacing at the close of the year 1924, according to the best available estimates. If the last year's work has been as productive as that of 1924—and there is every reason to believe that it has been—the surfaced roads at present aggregate not far from 500,000 miles, about one-sixth of the total mileage.

Accepting the latter figure as reasonably representative of the present condition, it will be convenient hereafter to deal with the more exact figures of 1924, especially since surveys made by the Office of Public Roads in 1904 and 1914 furnish the statistical basis for the determination of the character and extent of the progress made during the last two decades.

According to these surveys there were 257,291 miles of surfaced roads in 1914, and 153,662 miles in 1904. The net increase during the first of the two decades was, therefore, a little over 100,000 miles, or approximately 10,000 miles a year; and this rate was more than doubled during the second and last decade.

The relative progress made during these two ten-year periods, however, is not expressed fully by the net increase in surfaced mileage. It is safe to say that practically all of the roads that were surfaced in 1904 have since been resurfaced and undoubtedly a considerable percentage of the 257,291 miles surfaced in 1914 has also been replaced with new, better and wider surfaces since that date. The real measure of progress made during the last decade is, therefore, not the net increase of more than 211,000 miles but a figure which much more nearly approaches the total of improved mileage at the close of the period.

Rapid Progress in Last Decade

The true extent of the change becomes apparent when we examine the character of the roads classified as surfaced at the three survey periods. Of the 153,662 miles surfaced in 1904 only 141 miles, or less than one-tenth of 1 per cent of the total, were improved with a surface better than waterbound macadam. By 1914 the mileage of this class of roads had increased to 14,830, or 5.8 per cent of the total mileage then surfaced; but more than two-thirds of the roads so

classed were surfaced with bituminous macadam and surface-treated water-bound macadam, the least durable of the types included in the class. The increase in the mileage of high types to a total of 89,771 miles between 1914 and 1924 is, therefore, more remarkable in view of the fact that the surface-treated and bituminous macadam roads constituted in the latter year less than half of the total mileage of the class, which as a whole represented more than 19 per cent of the total surfaced mileage. More than 45,000 miles in 1924 were paved with concrete, brick, bituminous concrete or equivalent types; and the average width and strength of all surfaces included in the high-type class were doubtless considerably greater than in the earlier years.

In 1904 there were 38,622 miles of water-bound macadam roads—practically 25 per cent of the total surfaced mileage. By 1914 the mileage of this type had increased to 64,898, but the percentage of the total mileage remained practically unchanged at 25 per cent; and in the last decade both the mileage and the percentage diminished, the former to 60,235 miles and the latter to 12.9 per cent, a relative decrease of nearly 50 per cent.

In all three years the roads surfaced with gravel and other low types of surfaces constituted the bulk of the surfaced mileage, but whereas in 1904 they constituted practically three-quarters of the total, in 1924 they represented only a little more than two-thirds. The mileage of these types in 1904 was 114,899; in 1914 it was 177,563; and in 1924 there were 317,960 miles.

These changes in the character of the surface mileage during the two decades are shown more clearly in the table given at the bottom of this page.

Low-Type Roads Served Early Traffic

The year 1904 marks the end of a period. Up to that time there had been no important change in the methods of road construction which had been employed for a century or more. The major types of surfacing were gravel and macadam, and either was known to give entire satisfaction under the traffic normal to the country roads of the time. Other types had been developed and used in small mileage, such as the shell roads of the tidewater States and the sand-clay roads of the South, but the element of availability was the determining factor in the choice of such materials rather than any difference in the demands of traffic; and the same element in fact, largely determined the choice of the two major types.

Thus we find that there was a preponderance of gravel roads in Michigan, Indiana, Illinois, Iowa, Wisconsin, Minnesota and the Dakotas where gravel deposits were plentiful; and a preference for stone in Kentucky, West Virginia and others where suitable gravels were scarce. From New Jersey south, the Atlantic and Gulf States had built rather considerable mileages of oyster-shell roads; and the Southern States, in which there was a scarcity of other materials, had developed the sand-clay type. Even the small mileage of high-type surfaces which had been constructed was doubtless attributable less to traffic demands than to the availability of the materials, for of the total of 141 miles we find that 123 were paved with brick, and 104 were in the two States of Ohio and West Virginia where brick was cheap and perhaps the most available local material.

Viewed broadly the few types of surface constructed up to this time may all be considered as of one class. In the construction of all the same principles governed; in all a fragmental mass was bound together more or less firmly by a natural cement in the manner made familiar by a century of practice, and all alike depended for their efficacy upon the conic principle of pressure transmission by which they spread the vehicular loads and thus reduced the intensity of pressure borne, by the subgrade.

That need was felt for no other kind of construction was due, of course, to the fact that the traffic on all roads was much the same. Even in the most populous States the greater part of the traffic using the roads consisted of relatively light horse-drawn, steel-tired vehicles, to which were added near the cities a bicycle traffic which, though it might attain considerable volume, was never more than a negligible factor in determining the type of surface. This was the normal traffic condition which existed practically up to 1904. What makes that year a turning point in highway history is the fact that about that time there began the great outpouring of motor vehicles from the cities which quickly set the intercity roads apart from others as a class requiring different treatment.

The peculiar effect of the automobile on water-bound macadam roads is so well known as to require no description and the manner in which the road builders met the challenge by substituting tars and asphalts for the weaker mineral binders has been an oft-told tale. First as dust layers then as protective surface coatings, then as binders introduced into roads of the macadam type by penetration, and finally as hot admixtures according to the bituminous concrete principles, these materials, borrowed from the stock in trade of the city street builder, solved the automobile problem in a manner which was apparently entirely satisfactory.

The effect of this development in the road-building art is shown by comparison of the statistics of 1904 and 1914, the dates which, to all intents and purposes, mark the beginning and crest of the wave of bituminous construction. In 1904, according to the records, there were in the entire country only 18 miles of bituminous rural roads, all in the two States of Massachusetts and Ohio. By 1914 there were 10,500 miles, a mileage which was nearly three-quarters of the aggregate length of all roads of higher type than macadam. This was the highwater mark of the lower

Class of Surface	1904		1914		1924	
	Miles	Percent	Miles	Percent	Miles	Percent
Gravel and other low types	114,899	74.7	177,563	69.1	317,960	67.9
Water-bound macadam	38,622	25.2	64,898	25.1	60,235	12.9
Surfaces better than water-bound macadam	141	0.1	14,830	5.8	89,711	19.2
Total	153,662	100.0	257,291	100.0	467,906	100.0

Road Four—Project 36-B

forms of the bituminous types. That it by no means marked the end of their usefulness is indicated by the fact that 3,367 miles of the surface-treated and penetration types were built in 1924. The recession of the tide is indicated, however, by the fact that the mileage of the two types existing in 1924 was less than 50 per cent of the mileage of all types better than water-bound macadam in comparison with the 75 per cent level reached in 1914.

Heavy Loads Require Rigid Slab

It is generally recognized that these two types which came into use with the development of passenger automobile traffic are especially adapted to that class of traffic. The relative decline in their use began when motor trucks in considerable numbers began to appear on the rural highways; and coincidentally we find an increasing swing toward the rigid pavements of concrete and brick and bituminous concrete on a concrete base. The turning point was reached in 1914 or perhaps a year or two earlier.

The first concrete pavement was built at Bellefontaine, Ohio, in 1893, but up to 1909 no more than five miles had been constructed on rural highways in the entire country. In that year approximately four miles were built; in 1910 about twenty miles were added, the following year forty miles, and then the first big increase occurred in 1912 when more than 250 miles of rural highways were paved, to be followed in 1913 with 500 and in 1914 with more than 1,500 miles. At the close of the latter year there were in the entire country 2,348 miles; and ten years later the mileage had increased to 31,146 and construction was proceeding at the rate of more than 6,000 miles a year, a rate approached by no other type better than gravel.

The more extensive use of brick and the bituminous pavements of the mixed type on concrete base began also at about the same time and was due to the same cause—the increased use of motor trucks. In 1914 there were approximately 1,600 miles of brick pavement; in 1924 there were 4,319. In 1914 the mileage of rural highways paved with bituminous concrete or sheet asphalt was still negligible; in 1924 there were more than 9,700 miles of these types.

New Types Developed

The first of the two decades we have had under consideration was marked not only by the development of new types of road, but also by two other changes of even greater significance. The first of these was a general increase in the radius of travel by highway occasioned by the use of the automobile; and the second—a natural result of the first—was a

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B. A. Meginniss, Attorney for the Department, Editor and Business Manager

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change in the character of the public demand for highway improvement.

In 1904 the automobile had still to prove its ability for sustained performance. Its ownership was still limited to a small and wealthy class. The popular demand for improved roads was, therefore, still predicated upon the use of the bicycle and the horse-drawn vehicle. The farmers, always conservative, were still, for the most part, either actively hostile to road improvement or lukewarm in support of it. In general their demand was for the improvement of the roads connecting their farms with the railroad shipping points or nearby towns. More positive influence was exerted by city and town merchants who sought by road improvement to extend the trading radius and business of their towns and by the limited but influential class of motorists who longed for smoother, mud-and-dust-free roads upon which to operate their vehicles. All these influences combined at first to produce a demand for short stretches of improved roads radiating from the towns and rail shipping points. Later, as the automobile was perfected and its users became more numerous, the latter created a demand for longer, unbroken stretches of improved roads, forming a network connecting the larger towns, a claim that was resisted by the farmers who continued to favor the so-called farm-to-market type of improvement.

State Systems Created

In the smaller Eastern States the conflict never became acute, largely because the distance between towns and market points was so short that the farm-to-market plan of improvement when carried to its ultimate development became practically identical with the inter-town or trunk-line plan. Thus we find the issue satisfactorily settled in Rhode Island as early as 1902 by the adoption of a definite system of State highways for construction by the State Board of Public Roads. A similar proposal by the highway commissioner of Connecticut, made originally in 1906, was enacted into a law by State legislature in 1913; and in the meantime Maryland has settled the question definitely by the adoption of an inter-county seat trunk-line system to be improved and maintained in its entirety with State funds under the State Roads Commission. Maryland's system was designated in 1908 and was the first to be placed completely under State control for both construction and maintenance.

That the controversy was not so quickly settled in many of the other States was due mainly to two reasons. First, the important lines of travel in a number of States were not sharply defined. This resulted in some from sparsity of settlement, and in others from the contrary condition of close settlement, with numerous centers of more or less uniform size and importance. States such as Texas and Wyoming were typical of the first group. In them the long distances between centers and the condition of the roads delayed the development of highway traffic between the towns and promoted a use of the highways largely as feeders to the rail lines; and the same remoteness of the towns one from another prevented the early harmonizing of the two plans of development as in

(Turn to page 13.)

Chairman's Column

Menaces to the Motorist on Our Public Highways

THE number of automobile accidents due to the thoughtlessness of motorists and consequent failure to dim their headlights is quite considerable. I have personally observed several serious accidents due to this cause. How to put a stop to this class of accidents is one of our traffic problems. The difficulty lies in the fact that there is no one on the highways with authority to arrest or bring the violator before a court of justice.

Again I repeat that the State may find it necessary to provide for road patrol by night as well as by day that the sane motorists may be guaranteed safety from this source of hazard on our highways.

Then there is the motorist who drives his car with one headlight out and frequently the light on the far side from the motorist going in the opposite direction. Nothing except a heavy fine or jail sentence will bring this class of careless drivers of motor cars to their senses. This practice is entirely too general. Motoring from Marianna to Tallahassee the night of the tenth, six cars were passed with only one headlight burning and two without any headlights at all. This practice puts in jeopardy the lives of those who use our highways by night. The State is spending millions upon millions of dollars in the construction of good roads, and the question is shall they be highways of destruction or shall they be highways of safety? In the last analysis the question will ultimately have to be answered by the Legislature of the State. Something will have to be done as the

toll of life is too great. Air traffic has become safer than highway traffic in this country and is attended by far with fewer fatalities.

Another danger to the motorist who has regard for the safety and lives of others arises from monopoly of the highway by the "middle of the road driver." This class of motorists square their cars in the middle of the highway and pay no heed to signal of horn for room to pass and frequently give space grudgingly and stintingly. The result is cars wishing to pass are often forced to the edge of the road and there are instances where cars have been forced off the road entirely by this practice.

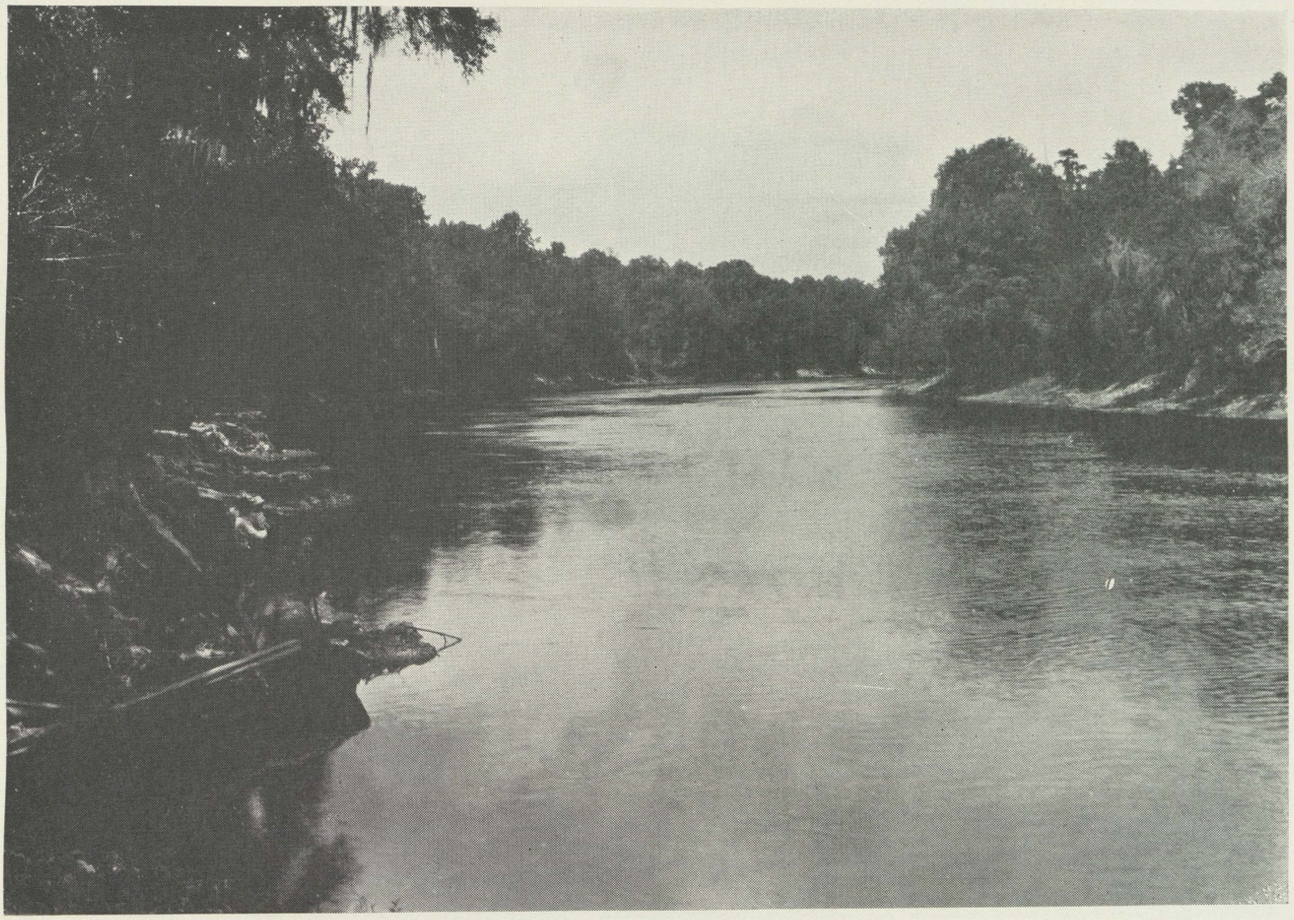
Another practice on our highways and one fraught with great danger is to be seen in the attempt of motorists to pass a car just ahead of him with another coming in opposite direction and rapidly approaching. It is very difficult to gauge either the distance or speed of an oncoming car. A motorist should never attempt to pass a car on an incline as there may be one on the opposite side of the incline approaching. Multiplied accidents have occurred on account of the heedlessness of motorists to observe this very simple rule.

The parking or stopping on the side of highways should be done with great care. The chief danger arises from the passing of the car parked by two cars at the same time. If it becomes necessary to stop car on the side of road the motorist should get his machine well off the pavement to avoid danger.

Perhaps the greatest hazard to life and limb comes from reckless and careless driving. The rate of speed is not the measure of recklessness for indeed a motorist driving at the rate of fifty miles per hour may not be the menace to others that the motorist driving twenty or twenty-five miles may be. The one may have full control of his car and "watching his step," while the other is switching criss-cross the entire road in utter disregard of the safety of others —too, may be disregarding every rule of safety on the highways. While there is, of course, danger from a too high rate of speed the accident and casualty list from this source of danger, I dare say, is not as great as from the careless driving of motor cars.

Finally, everything should be done to MAKE OUR ROADS SAFE FOR TRAFFIC.

State Road No. 2 (National Highway) Entrance to White Springs. During the Tourist Season approximately 2000 cars pass this point per day



Moonlight on the Suwannee River near Lake City where the Dixie Highway spans the stream.

Safety Considerations in Highway Design

By Sidney J. Williams, Director Public Safety Division, National Safety Council, Chicago.

(A paper read before the Western Society of Engineers, April 22, 1926.)

IN considering the safety features of highway design we must first ask what the highway is to be used for. I refer especially to the width and speed of the vehicles. As for width, most highway engineers have come to believe that 18 feet should be the minimum and many advocate 20 feet. A 20-foot roadway, however, is not safe for the newer type of buses, having a wide spread of the rear wheels, traveling at high speed (sometimes 50 or 60 miles per hour) and passing similar buses or other cars traveling in the opposite direction. For such traffic a 24-foot roadway was advocated by the 1924 National Conference on Street and Highway Safety which added "whether this extra width should be provided at public expense to accommodate a relatively small number of vehicles operated for hire is an economic question outside of the province of this committee." The report adds that if such vehicles operate on highways less than 24 feet wide their speed must be severely restricted when passing other vehicles and that they should not be allowed to operate at all on less than an 18-foot highway.

While the economics question just referred to was naturally dodged by this conference, it cannot be dodged by our highway authorities who are here confronted with much the same sort of problem that has always confronted the designers of railroad bridges—namely, how much additional investment to make on account of probable future increases in sizes and weights. I do not pretend to answer this question other than by stating the belief that, after all, the highways are built for the traffic, and not the traffic for the highways; with the present trend for more, larger and faster buses, we must prepare somehow to handle them with safety to themselves and to other vehicles on the highways, and this means a clearance of at least 2 feet between the edge of the tire and the edge of the pavement and more than that clearance between passing vehicles. Bridges especially should be made wide enough to care for future as well as present demands, with 22 feet of clear width as a minimum and more if possible and, on long bridges, separate sidewalks for pedestrians or, at least, occasional safety zones outside of the roadway.

(Turn to page 10.)

Project 31—Three trucks dumping lime rock at same time. Note stream of water being applied across piles.

North Carolina Road-Test Truck

By H. B. Shaw, Director, Engineering Experiment Station,
North Carolina State College.

IN their road-test truck the North Carolina State Highway Commission and the Engineering Experiment Station of North Carolina State College have a valuable device for measuring the power required to drive motor vehicles on all sorts and conditions of road.

The unique feature of this test vehicle may be stated briefly as follows:

1. It has an electric drive superimposed upon the usual mechanical drive.

2. The motors are series wound, of the railway or battery vehicle type. The electric generator also is "series wound," which is unusual.

3. Instantaneous and average values of speed and of the electric current in the single main circuit are determined independently. From them, the power delivered to the vehicle mechanism is easily calculated.

4. The road-test truck, at specific speeds, measures the average power instead of the tractive resistance. The latter, however, may be calculated from the power, speed, and mechanical efficiency.

5. The vehicle contains a specially constructed "antivibration" suspension for the graphic instruments, voiding the effects of the vehicle vibrations, tilts and jars.

6. An ampere-hour meter and the elapsed time are used to get the average value of the electric current for a run, instead of averaging the current from the charts of the recording ammeter. This saves much time.

The test vehicle is operated at a selected speed which, for accurate measurements, must be kept constant during a run. It requires some practice to keep the speed constant by manipulation of the throttle of the gasoline engine. The speed commonly used for test runs is 15 miles per hour, though tests have been made at speeds as low as 2 miles per hour and as high as 30 miles per hour.

A feature of this electric drive is that it does not retard the vehicle motion downhill nor will the vehicle measure the power when none is required, as when coasting. Consequently, the brakes have to be used to hold the speed constant on down grades of any consequence.

The vehicle will measure the power at different speeds on hilly roads, the power to pull through mud, sand, etc. To get the comparative horse-power on different road surfaces it is preferable to select fairly level roads and avoid the necessity of calculating and eliminating the effect of grades.

A large number of test runs on a race track showed, at 15 miles per hour, the following results:

10.30 horsepower when the surface was wet and muddy.
9.30 horsepower when the surface was partially dried.
8.50 horsepower when the surface was nearly dry and somewhat rough.
5.17 horsepower when the surface was in the best of condition, dry and fairly smooth.

The effect of the speed of the truck upon the horsepower required when the race track was in the best condition is shown by the following results:

At a speed of 2½ miles per hour, 0.67 horsepower.
At a speed of 5 miles per hour, 1.40 horsepower.
At a speed of 10 miles per hour, 3.10 horsepower.
At a speed of 15 miles per hour, 5.17 horsepower.
At a speed of 20 miles per hour, 8.10 horsepower.
At a speed of 25 miles per hour, 12.45 horsepower.
At a speed of 30 miles per hour, 19.00 horsepower.

Analysis of the internal losses, analysis of tractive resistance, recalibration and study of all the functioning of the test vehicle are now being made. The measurements are sufficiently delicate to permit very accurate adjustment of brakes, tests of the effect of different lubricants upon power losses, etc.

When the present laboratory investigations are completed, the test runs are to be resumed and continued for at least a year in order to get all-year, all-weather comparative horsepower for different road surfaces.

The further intention is to use the comparative horsepower as a basis for getting the difference in mileage cost for gasoline, tires and maintenance resulting from operation on different road surfaces. Neglecting other savings in cost due to hard-surfaced roads, the differences in cost per ton-mile for tires, gasoline and maintenance can be taken as the differences in cost per ton-mile for different road surfaces and used to determine the economy of highways.

The results are expected to demonstrate quantitatively the volume of traffic at which expenditures for first-class highways are economically justified, through saving more in the cost of vehicle operation than the additional annual cost of the improved highway.—Municipal and County Engineering.

DIZZY DOINGS ON THE DESK

The pencil has made quite a number of pointed remarks about the sponge being soaked all day and the waste basket being full. The scissors are cutting up and the paper weight is trying to hold them down while the paste is sticking around to see the stamps get a good licking. The ink's well, but appears to be blue, while bill is stuck on the file, and the calendar is looking fresher after having had a month off. The blotter is lying around taking it all in.—Exchange.

Road Two—Project 31—Hamilton County.

SAFETY CONSIDERATIONS

(Continued from page 7.)

Many two-lane highways today are overcrowded, raising the question of increasing the width to accommodate three, four or more lanes, or building additional parallel highways. This is not particularly a safety question except as to the three-lane highway. In common with most highway engineers I do not advocate the three-lane highway except in very special cases. Aside from any other considerations it is evident that on a highway where three lanes of traffic can move safely—say 27 or 30 feet wide—four lanes can move unsafely, and frequently will. On a three-lane highway, lines on the pavement delimiting the lanes are particularly desirable.

Pavement Marking Promotes Safety

Pavement markings in general are being used more and more, and should be. I believe in the Illinois practice of center lines on straight-aways as well as on curves, for I believe they add much to ease and safety in driving. In some of the Eastern states, a contrary opinion is held, namely, that the center line should be used only on curves and in other places where the overtaking of another car is forbidden by law; that is, the motorist should know that he is never permitted to cross or drive on the wrong side of a center line. If this is to be the rule, then obviously center lines could not be used on straight-away because then there would be no overtaking. This matter was argued at length in committee meetings of the national conference two years ago, leading to the compromise decision that a white line should be used only at points where it is illegal to cross the line or be on the wrong side of it; that black lines may be used elsewhere, as on straight-aways.

In addition to center lines, other pavement markings are being and should be used more and more for both safety and convenience, to supplement signs by the roadside as a means of telling the driver what he is to expect or what he is to do. The National Safety Council has been making a study, not yet completed, of the extent and nature of the use of pavement markings both within cities and outside. Eventually, and the sooner the better, there should be some standardization of the design and meaning of pavement markings, under proper auspices, and covering both city streets and rural highways, so that a certain marking will mean the same thing not only in different states but within cities as well as without. There is great need for engineering study and development of satisfactory permanent pavement markings inlaid or otherwise which will be cheaper in the long run than the frequent renewal of surface painting.

Speed Limits May Be Increased

For what speeds shall our highways be designed? With the developments in vehicle design and construction, highway speeds have been increasing and will doubtless continue to do so.

Some of you know that in the matter of automobile speeds within cities I have been among the persistent advocates of the enforcement of moderate speeds, for example, a prima facie limit of 20 miles per hour in residence districts. This is because, in cities, we have various conditions which cannot be altered nor certainly controlled—buildings and other obstructions to view, congestion of traffic, and most important of all, the ever-present likelihood of some unexpected or careless action on the part of other users of the highway, drivers and pedestrians and especially children. Furthermore, we know that to relieve congestion and expedite traffic in a large city, what we need is not a higher maximum speed but a more uniform and therefore a higher average speed through the elimination of obstacles and delays.

On the open highway the situation is different. There, higher speed is really a boon to the motorist traveling a considerable distance; and speeds of 40 or 50 miles an hour may be perfectly safe, with a good car, tires in good condition, no pedestrians, a well-built highway, and no obstructions to the view. With further advances in the reliability of cars and tires these figures may be still further increased. I do not wish to be understood as advocating any change for the present, at least, in the prima facie limit of 35 miles per hour on the open highway which is found in the laws of many states and in the model motor vehicle law recently developed by a representative national committee and adopted by Secretary Hoover's National Conference on Street and Highway Safety. But it seems to me that the occasions on which the prima facie limit may be exceeded with entire propriety, both legal and moral, are much more frequent on the open highway than in the city and that even assuming complete compliance with existing laws, speeds of 40 and 50 miles per hour must be reckoned with by the highway builder. I must add that the model law already referred to recognizes the present trend by providing that where a highway is made an arterial or through highway with stop signs at every intersection, the 35-mile limit may be increased by action of the local or other regulatory authorities.

This paper is not intended to be a discussion of automobile legislation nor of safe speeds and I have mentioned these only by way of pointing out that modern highways must be designed on the expectation of rather high speeds even at present, and with the likelihood that these will increase rather than diminish in the future. This means, obviously, generous widening and proper super-elevation of curves, together with transition curves, as already generally accepted by designers. It also means that the removal of obstruction and the providing of a clear view is of ever-increasing importance.

Remove Obstructions to View

The distance along which an unobstructed view is necessary, depends directly on the stopping distance of, not the best nor even the average but the most poorly-braked cars. Recent studies of the U. S. Bureau of Standards and others have shown that we cannot hope to enforce a higher standard for brakes than that corresponding to a stopping distance of 50 feet from a speed of 20 miles per hour. A very large percentage of cars now on the highway, including a great many trucks do not conform to even this standard.

(Turn to page 12.)

Contracts Awarded by State Road Department January 1, 1926— August 13, 1926

Contractor	Project No.	County	Roads Length Miles	Bridges Length Feet	Contract Plus 10%	Type
Noonan-Lawrence	51	Escambia	6.25	....	$ 206,575.89	Conc.
J. S. Walton & Co.	648-B	Hardee	....	615	83,228.09	Conc.-Tmbr.
Chas. F. Wilmore	641-A	Palm Beach	11.36	....	86,081.38	Grade
Gillis Const. Co.	644-A	Wakulla	8.49	....	47,367.49	Grade
L. M. Gray	617-618	Alachua	16.06	....	248,123.10	R. Base
Montgomery & Parker	633-B	Gadsden	....	240	39,591.47	Conc. Bridge
Peterson & Earnhart	672-B	Leon	....	1950	197,377.45	Conc. Bridge
Concrete Steel Bridge Co.	641-B	Palm Beach	....	237	120,766.80	Conc. Bridge
Concrete Steel Bridge Co.	656	Palm Beach	....	727	222,200.60	Conc. Bridge
American Bascule Bridge Corp.	641-656	Palm Beach	....	120	63,573.40	Bascules
J. W. Hall	689	Alachua	1.67	....	10,599.42	Grade
H. E. Wolfe	562-A	Highlands	5.37	....	142,837.33	S. T.
C. A. Steed & Son	694-694-A	Martin-St. Lucie	8.48	....	61,599.45	C. G. & G.
Boone & Wester	693	St. Lucie	8.73	....	59,670.88	C. G. & G.
Duval Engr. & Contr. Co.	31	Hamilton	11.82	....	241,489.11	R. Base
F. S. Whitney	642	Putnam	10.18	....	210,025.00	R. Base
Wm. P. McDonald	675	Polk	5.16	....	256,969.88	S. A.
Noonan-Lawrence	500-A	Bay	9.65	....	334,691.65	Conc.
R. H. H. Blackwell	693	St. Lucie	....	160	80,466.96	Conc.
C. A. Steed & Son	694-694-A	Martin-St. Lucie	....	327	125,796.52	Conc.
W. P. McDonald	648	Hardee	1.00	....	31,363.20	R. B. S. T.
Gilbert & Hadsock	676-A	Levy	9.95	....	48,875.58	C. G. & G.
McLeod Const. Co.	676-B	Levy	14.39	....	135,259.30	C. G. & G.
Peterson & Earnhart	673	Gadsden	....	20	10,727.20	Conc.
Atlantic Bridge Co.	38	Escambia	....	....	28,260.98	Surface
Lake Worth Const. Co.	543	Seminole	14.2	....	109,759.62	C. G. & G.
A. Bentley & Son Co.	621-C	Okaloosa	....	1363	147,295.80	Conc.
A. Bentley & Son Co.	621-B	Okaloosa	....	1568	157,361.60	Conc.
E. F. Powers Const. Co.	668	Brevard	13.45	....	119,128.58	C. G. & G.
E. F. Powers Const. Co.	564-C	Charlotte	3.93	....	42,264.98	C. G. & G.
L. M. Gray	595	Volusia	6.43	....	122,022.17	R. Base
B. Booth & Co.	53-A	Lake	7.09	....	60,252.65	C. G. & G.
H. E. Wolfe	589	Charlotte	8.16	....	174,725.21	R. Base
W. J. Bryson Paving Co.	614	Sarasota	17.08	....	129,895.29	C. G. & G.
Atlantic Bridge Co.	634-B	Jackson	....	456	70,707.86	Conc.
Duval Engr. & Contr. Co.	504	Columbia	9.41	....	178,551.36	R. Base
R. C. Huffman Const. Co.	669-C	Dade	12.00	....	311,027.69	Grading
L. B. McLeod Const. Co.	682	Citrus	6.45	....	106,241.56	R. B.
Wilson Pipe Co.	564-C	Charlotte	....	134	43,123.52	Conc. and Steel
M. C. Winterburn, Inc.	659	Clay	13.27	....	133,334.45	C. G. & G.
H. E. Wolfe	655	Highlands	5.00	....	105,874.01	R. Base
Broadbent Const. Co.	564-B	Charlotte	9.73	....	190,330.76	R. Base
Thompson & Moseley	589	Charlotte	6.66	....	10,916.86	Conc.
Wm. P. McDonald Const. Co.	663	Citrus	8.03	....	138,345.79	R. Base
Peterson & Earnhart	48-B	St. Johns	....	456	81,700.91	Conc. Bridge
F. M. Stuart & Co.	49-B	Flagler	....	200	62,967.30	Conc. Bridge
Baker & Foulks	533	Suwannee	13.47	....	249,410.72	R. Base
Alexander, Ramsey & Kerr	669-V	Collier	11.91	....	382,631.70	C. G. & G.
Alexander, Ramsey & Kerr	669-X	Collier	9.39	....	104,164.50	C. G. & G.
Johnson, Drake & Piper	565	Madison	15.99	....	464,271.36	Conc.
E. W. Ellis	687-A	Lake	15.00	....	120,043.11	C. G. & G.
Peterson & Earnhart	673-B	Gadsden	....	418	61,525.44	Conc. Bridge
A. J. Hoffman	677-A	Levy	6.96	....	38,450.94	C. G. & G.
Langston Const. Co.	676-C	Levy	13.93	....	93,096.41	C. G. & G.
Preskett, Paterson & Blackwell	14	Santa Rosa	6.00	....	96,568.34	Conc. Shoulder
E. Roy James	50-C	Putnam	10.03	....	89,350.31	C. G. & G.
Duval Engr. & Contr. Co.	7	Hamilton	12.90	....	246,862.55	R. B.
Wm. P. McDonald	679	Hernando	7.11	....	129,358.28	R. B.
M. C. Winterburn, Inc.	534	Brevard	10.00	....	132,405.26	R. B.
Totals			395.51	8,991	$7,745,270.77	

SAFETY CONSIDERATIONS

(Continued from page 10.)

For a speed of 40 miles this means a stopping distance of 200 feet; a speed of 60 miles means a stopping distance of 450 feet. Perhaps the latter may be disregarded because a car capable of 60-mile speed, with any sort of comfort to the occupants, is ordinarily a car equipped with good four-wheel brakes. But there are, and will be many flivvers on our highways doing 40 miles an hour, that would have a hard job to stop from that speed in 200 feet. Adding a like distance for the on-coming car and we see that an unobstructed view of 400 feet at least, is necessary for safety, or 200 feet each way from an intersection. These distances should really be increased in view of the likelihood of skidding and also to allow for the interval which elapses between the sight of the on-coming car and the actual application of the brakes. Looking ahead five or ten years it is easy to foresee a time when a point of obstructed vision on a highway will either be the scene of numerous wrecks or will force such a slowing down as to constitute a serious "bottleneck." We shall have to spend more money, in the future, in the removal of obstructions, even trees and shrubbery of artistic value as well as sign boards of inartistic value; widening of cuts at curves and at intersections; the increasing of vertical radii at crests; and even the condemnation of buildings and other structures where they constitute a serious obstruction to view.

Provide Wide Shoulders or Parking Spaces

I have omitted to mention various other safety considerations because they are either obvious or have been already accepted by up-to-date designers; items such as minimum crown; easy grades especially when combined with curves; liberal curve radii; and the provision and maintenance of adequate shudders. Highway signs are very important for safety but this forms a subject in itself. The same may be said of the elimination of railroad-highway grade crossings, and their protection, and designers have likewise become alert to the need for special provision at the intersections of two important highways. We have come to recognize that the parking of vehicles on the highway is dangerous as well as a nuisance to other motorists and that this can be prohibited only if we provide parking places not more than 300 feet apart, outside of the pavement line, or better still, a continuous shoulder wide enough for the same purpose. We also recognize today the importance of proper selection and conditioning of detours, for both safety and comfort. The initiative of the manufacturers of new types of metal guard rails has brought rapid progress in this field—for while the slow processes of safety education are striving to make railings unnecessary, the highway designer, facing a condition and not a theory, must still share the responsibility commonly attributed to Providence for watching over drunken men and other fools.

The super-highway—that dream of the highway engineer, in which capacity, safety and speed shall all be at a maximum—is coming every year a little closer to reality. I have not time nor is there need to describe the progress already made in building portions of super-highways near Detroit. The ideal, of course, is a roadway or set of roadways of ample width, proper surface, and each of them carrying homogeneous traffic in one direction only, with no pedestrians and no grade crossings of any sort. In a few highly-congested districts it will be economically possible to build such arteries of transportation.

But ninety-nine and a fraction per cent of our highways will always be in the other class requiring a continual balancing of safety versus speed versus cost. Here the "Safety men" ask nothing more than that the highway designer accept safety as one of the objects—not the sole object—of his design, and I for one have nothing but praise for what the highway engineers of today are doing to make our highways safer, with the limited funds at their disposal. The real safety problem on our highways is not poor design but incompetent and careless driving.

RULES FOR PEDESTRIANS

Latest figures show that American pedestrians are now dodging 20,051,276 automobiles of all styles and dispositions.

The quota for each car is six pedestrians, running, walking, or lying down.

What we need is a good set of traffic rules like the following for persons who insist on crossing streets in spite of all friendly warning in the newspapers:

Rule 1—All persons desiring to engage in the regular pursuit of crossing streets must take out a license and leave a statement showing name of their favorite hospital. This permit will be revoked after holder has been knocked down and run over three times, unless he gets a license entitling him to additional accidents.

Rule 2—Pedestrians who start across the street in the middle of the block are allowed three downs. If they can't make the morgue at the end of the third down they then have the right to take a gun and shoot themselves.

Rule 3—In being knocked down by an eastbound car, pedestrian must make a left turn. If driver fails to shout "Look out, there" after he has run over a pedestrian, the latter is liable to fine and arrest and may, at the discretion of the court, have his name misspelled in the telephone directory.

Rule 4—In crossing a street slow down to a run. The driver's score does not count unless both shoulder blades of the pedestrian touch the pavement.

Rule 5—Pedestrians who find themselves unable to get flattened out in any other way have the right to try crossing a street corner diagonally. Every man must stand up for his right to be knocked down.

—Harry Daniel in Thrift Magazine.

DEVELOPMENT OF IMPROVED HIGHWAYS

(Continued from page 4.)

the smaller Eastern States by the evolution of one into the other. Of the second class there were such States as Iowa, Kansas and Wisconsin, in which the very number and uniform size of the town centers caused a diffusion of traffic over many roads and delayed the recognition of routes of outstanding importance. In these States also the towns are essentially agricultural centers and this fact contributed further strength to the demand for farm-to-market roads as opposed to trunk lines.

The instances mentioned furnish examples of one of the reasons for the prolongation of the controversy which raged over the question of farm-to-market vs. trunk-line development. The second reason was simply that many of these States as yet had no State agency for the administration of a highway plan of State-wide scope, and the development of the trunk-line plan naturally presupposes the existence of such an agency.

Federal Aid Develops Trunk Lines

The second of these reasons was promptly removed after the passage of the Federal Aid road act in 1916 by the provision of that act requiring the creation of adequate highway departments in all States as a condition precedent to participation in the benefits of the Federal aid. And a first step toward the ultimate settlement of the trunk-line question in all States was made when the Bureau of Public Roads as one of its first administrative acts requested of all States the submission of a five-year program map showing the system of roads upon which the State highway departments would request Federal aid during the period covered by the appropriations provided by the first act of Congress. Although the systems designated in response to this request were understood to be merely tentative the request of the Bureau had the effect of directing attention—in many States for the first time—to the desirability of establishing a definite program for the improvement of a system of highways as distinguished from the more or less casual improvement of unrelated sections of roads.

The Federal aid work had scarcely begun, however, when the war intervened and practically put a stop to all operations; and the war did a number of other things to the existing improved roads which, however disastrous they may have appeared at the time, have turned out to be blessings in disguise. At the outset the construction and maintenance of highways were declared to constitute a non-essential industry. As a consequence new construction, except as required for the immediate service of the army, was greatly curtailed. This result is reflected in the records which show in 1916—the year before America's entrance—a construction of the roads under the supervision of the State highway departments amounting to 16,160 miles a decline to 11,996 and 11,944 miles respectively in 1917 and 1918; and a return to 18,260 miles in 1919. Maintenance also was greatly hampered by the difficulty of obtaining the necessary materials and the scarcity and high wages of labor. At the same time there was released upon roads generally inadequate to stand it an unprecedented traffic of heavy motor trucks. To this experience and the heavy damage which followed we owe the development of most of the sound principles and policies which now govern the improvement of highways.

The first result was a strong reaction against the use of heavy motor trucks. There were large numbers of people who, forgetting that a road is of service only in so far as it accommodates the need for economical transportation, demanded that the manufacture and operation of vehicles too heavy for the existing roads be prohibited. As few of the roads were designed to carry motor-truck traffic, to have taken this course would have amounted to the throttling of a new development in transportation before it had a chance to demonstrate its utility, and it was rightly opposed with great energy by the manufacturers of motor vehicles. The latter, on the other hand, took a position at the opposite extreme from which they demanded the right to manufacture and sell heavy vehicles of large capacity, without regard to the strength of the roads, on the theory that the greater the capacity of the vehicle the smaller would be the cost of operation per unit of capacity. Their slogan was "build the roads to carry loads," and this was met by the opposite party with the equally dogmatic demand that the loads should be limited to the capacity of the existing roads.

The issue thus joined, the principals to the controversy, highway officials on the one side and the manufacturers on the other wisely agreed to submit their difference to the test of mutual discussion; and out of the series of conferences which ensued there came an agreement upon certain fundamental facts and principles which have served as the basis for a harmonious co-operation of the two groups, and which now constitute the foundations of highway improvement policy in all States.

Agree on Maximum Loads

It was agreed at the outset that for the first time in history the weight of vehicles had become a critical factor in rural highway design. Hitherto the minimum practical thickness of road metal had been sufficient to carry the maximum vehicular load. The development of the motor truck had altered this situation. It called for stronger surfaces that would spread its heavier load over a wider area of the subgrade in order to reduce the intensity of the pressure to an amount which the soil would support.

It was clear also that whereas deterioration of the highways had previously resulted mainly from the attrition of the surface, a new form of deterioration approaching rapid destruction would result unless the roads upon which the heavier motor trucks were being operated were strengthened so as to enable them to carry the increased weights. And whereas, the amount of the deterioration had formerly been a function of the volume of the traffic and of time, the new destruction by excessive weight might be caused by a few vehicles in a very short time.

It was agreed, therefore, that the highway officials

must have definite knowledge of the maximum weight to be supported as a first condition of design; and this knowledge was supplied, in a measure, by the voluntary decision of the manufacturers to limit to 7½ tons capacity the future production of vehicles. Engineers were thus assured that if, in the reconstruction of the thoroughfares upon which heavy trucking had developed, they would design to accommodate a vehicle of 7½ tons capacity they would not see their handiwork quickly destroyed by vehicles of much greater size and weight.

Reduce Total Cost of Transportation

But this alone was not a sufficient basis for the design of all roads. The building of roads of sufficient strength to carry 7½-ton trucks required a heavy investment of public funds, which could be justified only if the economies inherent in the transportation of goods in vehicles of large capacity were sufficient to outweigh the increased cost of the roads. It was recognized clearly for the first time that the cost of highway transportation is made up of the cost of the highways and the cost of operating the vehicles over the highways, and it was agreed that the common purpose of the public highway officials, vehicle manufacturers and operators should be to reduce the total cost of transportation rather than one or the other of the elemental costs. It could be proved that the number of large-capacity trucks already using some of the highways—principally those radiating from and connecting the larger cities—had already grown to the point where the combined savings in operating cost would more than balance the greater cost of providing highway service for them. As to these highways there could be little doubt of the wisdom and economy of building a type of surface adequate for the heavy truck traffic. Other roads, similarly located with respect to cities, had not yet developed a sufficient amount of heavy traffic to repay the additional cost of the stronger construction, but it was not difficult to foresee that such a condition would develop in the future. On the majority of the roads, however, the development of traffic of sufficient weight to justify the higher types of construction was very remote; and it was apparent that the one-time prevailing condition of uniformity of traffic of all roads had been definitely broken down. Instead, a new and much different condition had arisen under which the main intercity roads were found to be carrying traffic far in excess of the much greater mileage of local roads.

Under the new condition the economic justification for the improvement of the main roads lay to a far greater extent than formerly in the reduction of transportation costs and to a lesser degree in the effect upon the value of property. The main roads had become through traffic arteries, as distinguished from the more numerous local roads which continued to be of value primarily through the service they render in giving access to the land.

Main Road Traffic Increases

As to the main roads, which carried a wide-ranging traffic, it was now clearly apparent that the character of their improvement must be commensurate with the density of their traffic; that continuity of improvement was of the highest importance; and that the traffic was already so great that the loss in operation of vehicles in the absence of road improvement would exceed the cost of improvement. These roads also were distinguished in one other respect, namely, that their traffic tended to increase far more rapidly than that which was to be found on the local roads, the condition of which remained much as it had been. Where the main roads carried long-distance traffic, the local roads served the traffic of a neighborhood; where the main roads were collectors of traffic, the local roads were feeders and distributors; where the traffic of the main roads tended to grow in direct proportions to the growing use of motor vehicles and the growing resort of industry and the entire people to highway transportation, the local roads served the much lighter, and, from the standpoint of growth, far more stable traffic produced by a single agricultural community.

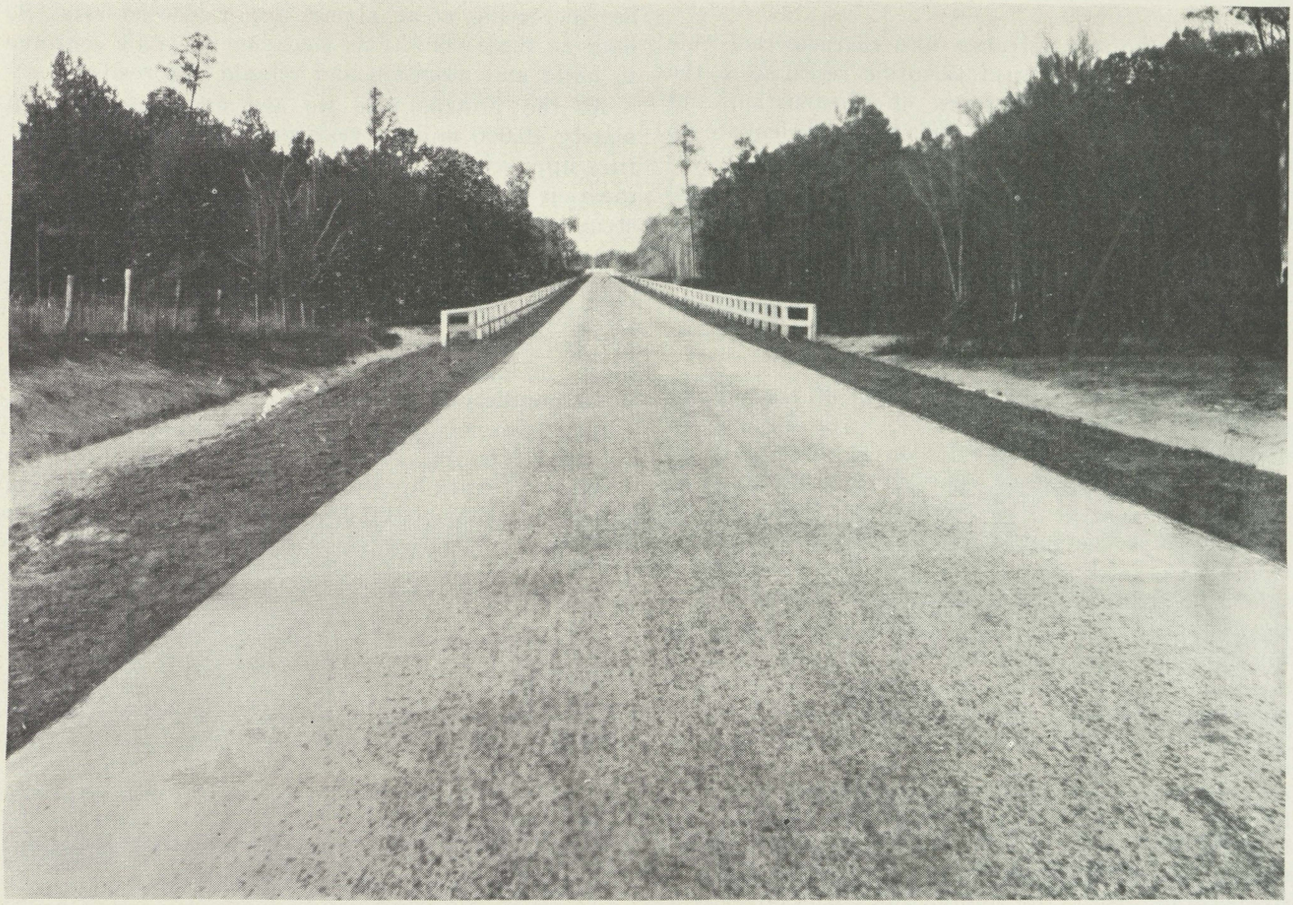
It became apparent, therefore, that the economic justification of local road improvement would continue to rest largely in the value and importance of the land that, in the main, the traffic would demand only a low type of improvement; and that continuity of the improvement was not so essential as in the case of the main, through roads.

National System Established

The need of continuity in the improvement of the main roads was the first of the new conditions to be met with appropriate action. From 1915 on, all States in rapid succession designated systems of State roads, including generally the main inter-city roads, to be improved under the more or less direct supervision of the State highway departments; and the several State systems were substantially welded into a national network by the designation, in 1921 of the Federal aid highway system which, though not quite co-extensive with the State systems is practically coincident with them throughout its extent.

Continuity of improvement of the main roads thus assured it remained for a joint committee representing the American Association of State Highway Officials and the National Automobile Chamber of Commerce to enunciate a policy with respect to the rate and manner of the improvement which could win general support and adoption.

Briefly that policy may be stated as follows. It is accepted as a truism that the volume of traffic on the main roads is so great that the economies in transportation effected by road improvement clearly outweighs the cost of the improvement. This being true the improvement should proceed as rapidly as available supplies of labor and material will permit and without other limit. All roads should be improved to the degree justified by the operating savings that may be expected to accrue to the traffic, and no road should be improved to any greater degree. Where the mileage of road to be improved is so great that the type of improvement indicated by the traffic cannot be completed on the whole mileage within a short period the most important sections should be raised immediately to ultimate type, and the balance of the mileage should be advanced through the initial stages of grading, draining and low type surfacing in order to spread as much of the benefit of improvement as quickly as possible over the entire road system, further improvement to



State Road No. 2—South of Lake City. Paved to Tampa.

await the completion of the first stage over the whole system. This is the practice known as stage-construction and it is the only feasible practice in the numerous States in which a large mileage of main roads remains to be improved in the face of a traffic already highly developed. It is also the logical plan of development for the main roads of the States in which traffic has not yet grown to the proportions justifying high-type surfacing.

Plan for Ultimate Growth

In any case the stage-construction plan takes account of the rapid growth of traffic, which is a characteristic especially of the main roads, by providing fully in the initial stage for the subsequent construction. Grades and alignment are designed to meet ultimate requirements; drainage structures are built of durable materials; rights-of-way of ample width for the future are obtained; and the initial surfacing becomes the sub-base of the second-stage surfacing. Obviously the soundness of the plan is contingent upon the complete and continuous maintenance of each stage of the construction, a kind of maintenance which—thanks to the war experience and the standard established by the Federal Highway Act—practically all States are now prepared to give.

The accepted policy contemplates the improvement of the main roads, to which the above methods are applicable, as a responsibility of the States to be assumed through the agency of the State highway departments, and financed, in large measure, by the revenues derived from the taxation of vehicles and motor fuel. The local roads are viewed as the responsibility of the counties and lesser subdivisions. With a few important exceptions, as in the case of Cook County, Illinois, and the vicinity of other large cities, the degree of improvement required does not rise above the lower types of surfacing, the expense of which may be met, as it should be, by taxation of the local land and property.

These, then, are the outstanding developments in highway improvement of the post-war period: The classification of highways according to traffic density; the designation of State highway systems in all States, the systems including the heavy traffic highways of State-wide importance; the intersection of the State systems by means of the Federal aid system; the improvement of roads in accordance with traffic demands to the limit set by probable operating savings; the stage-construction plan of progressive improvement of entire systems; and the development of adequate maintenance provisions. In the main, all are outgrowths of the war experience fostered by Federal aid.

Research Develops New Science

One other great advance has characterized this period—the application of scientific research to the problem of developing types of construction and methods of administration and finance adequate to meet the demands of the fast-growing traffic. In this also the initial impulse came from the Federal Government and, in co-operation with State highway departments and universities, it is continuing to support numerous studies in several fields, as a result of which there is being built up gradually the structure of a new science—the science of highway engineering.

The investigations include studies of the characteristics of materials—sand, stone, gravel, bituminous materials, cement, concrete and brick; determination of the forces applied to road surfaces by standing and moving vehicles; of stresses developed in the structure of roads and bridges by live loads, and by temperature and other natural causes; analyses of subgrade soils and tests of methods designed for their improvement; studies of the flow of water through drainage structures, of the run-off from drainage areas, of the effect of moisture on soils, and many others of fundamental importance and value.

Popular interest has centered upon the large scale tests such as those of the Bates Road, for which entire credit is due the Illinois department, the Pittsburg (Calif.) experiments, the impact tests at Arlington, Va., and the intensive studies of highway traffic conducted by the Bureau of Public Roads in co-operation with the authorities of Connecticut, Maine, Pennsylvania, Ohio, California, Tennessee and Cook County, Illinois.

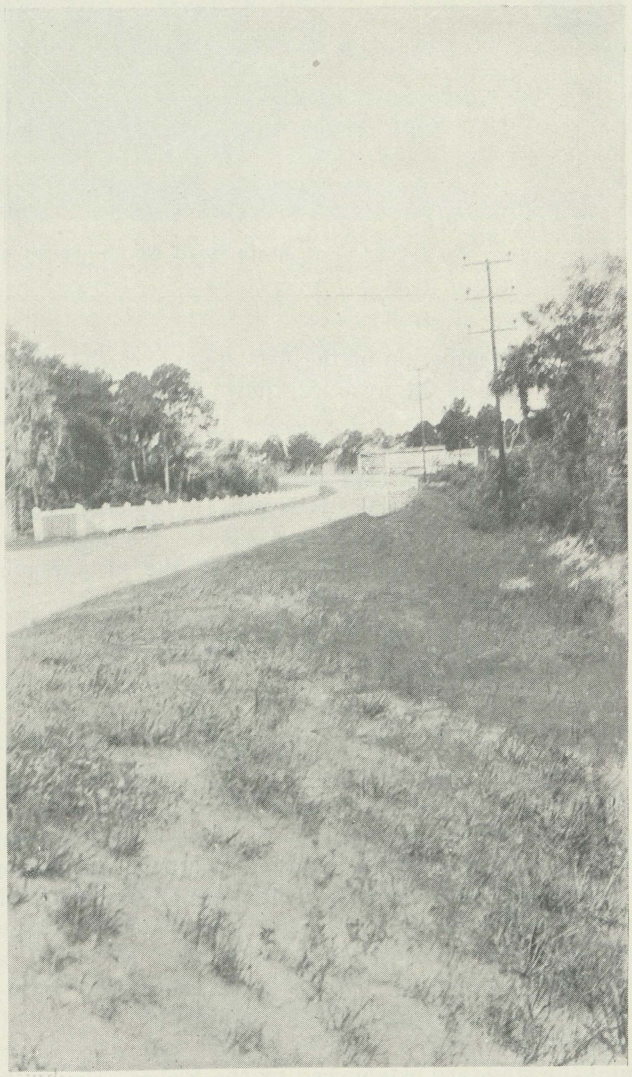
Building for the Future

Much that is of immediate practical benefit has already been derived from these investigations; but, for the most part, they are dedicated to the future.

It is not to be expected that their fullest benefits shall be immediately realized. The building of a science is a laborious, a painstaking process, and we are still but laying the groundwork which is not much further advanced than were the foundations of the modern science of medicine and surgery 50 years ago. If 50 years hence the science of highway engineering has been built up to the point now attained by the physicians and surgeons this effort we are now putting forth will be abundantly repaid, and not too late. For the improvement of highways in the United States is a process which must be continued indefinitely.

It is idle to talk of completion when of the three million miles of our highways less than a fourth have been graded, but a sixth has been surfaced and a sixtieth paved; when little more than half the mileage of the main State roads has been improved with any kind of surfacing, and there remain on these important arteries thousands of substantial one-way bridges and dangerous railroad grade crossings; when the number of motor vehicles registered is doubling every fifth year and the traffic with them; when the size of our cities and the magnitude of our industries, and the amount of our material wealth are increasing at an almost unprecedented rate. So long as these conditions continue we shall continue to build and maintain and rebuild our roads.

At the present rate we are surfacing approximately 40,000 miles a year and our annual expenditure approximates a billion dollars. There is no indication of an early reduction in these rates of construction or expenditure, dwarfed as they are by the annual production of a 1,000-mile procession of motor vehicles and an annual expenditure for operation approaching ten billions. As a nation we have set our hands to the economic improvement of our means of highway transportation. It is not a task to be accomplished in a day. It is, and must be a continuous process. There is but one limit which may reasonably be set. It is this: No road should be improved by expenditures of public funds in excess of its earning capacity. The return to the public in the form of economic transportation is the sole measure and justification of the degree of highway improvement.



State Road No. 4—Project 554.

Titusville—Road Four—Project 40-D.

Highways and Country Life

(Editor's Note: The following editorial article entitled, "Roads and Rubes," was published in a recent issue of the Minneapolis Daily Star.)

Reliable estimates indicate that the United States will spend more than $1,000,000,000 on the building and maintenance of rural roads during the year 1926.

This means the disappearance of the "rube" from American life. You may be able to find him on the stage, in vaudeville, in the movies, or between the pages of alleged humorous magazines, but not on the farms.

The "rube" is a product of isolation and the spending of one billion of dollars for rural roads means an end of isolation. The American farmer from now on lives on a main traveled highway.

When the day's work is done he is only a few miles away from entertainment. If he prefers to sit by his own fireside he may read his daily paper delivered by the rural routes, get his daily market reports over the radio, or listen to the best music and lectures that America can offer anyone.

His children are seldom more than twenty minutes away from an excellent high school. There they are being trained in all the social graces, taught the fundamental principles of culture, and living a life as broad and beautiful as that enjoyed by any of the city children. On commencement day it is impossible to distinguish between the youths from the farms and those from the city.

The co-operative marketing associations have taught him the art of working with other men. The good road makes it possible for him to attend frequent meetings, participate in the discussions and become a part of the busy world of thinking and action.

Rural roads put him in easy touch with distant markets. If his local merchant cannot supply him with the goods he wants a couple of hours' drive will bring him to a city of 20,000 or more where he can buy anything he wants.

The modern farmer is not easily imposed upon. He is a poor customer for gold-brick merchants. Bankers' figures show that the average city dweller is much the easier victim of the con man.

Improved rural roads mean consolidated schools,

less loss in crops, advantageous marketing. The hard-surfaced road has done much to give the American farmer his opportunity as a business man.

It is true that the rural church has had hard sledding, but the farmer can reach the village or city church with greater ease over good roads than he could get to the rural church a few years ago through the mud.

Good roads make good citizens. The election booth is seldom more than five minutes away from the kitchen door and the farmer is voting, and rapidly learning his political lessons.

One billion of dollars spent for rural roads means that the American farmer is now living as close to the world as the city dweller. He no longer lives alone, astride his plow. He is on a highway where "the race of men go by."—Municipal and County Engineering.

Nicaraguan rebels have burned a distillery, which looks like a shrewd bid for U. S. recognition.—Chicago Daily News.

Parking space has been discovered at last. Afghanistan has one motor-car for every 1,200,000 inhabitants.—Wichita Eagle.

IT PAYS TO READ THE BIBLE

The fact that the Standard Oil Company has discovered oil and is operating wells in Egypt is generally known, but its reason for going to that ancient land to look for oil is probably not so well known.

It is asserted that the attention of someone connected with the company was attracted by the statement in Exodus 2:3, that the ark of bulrushes which the mother of Moses made for her child was "daubed with slime and with pitch."

Reasoning that where there was pitch there was oil, and if there ever was oil in Egypt it was probably still there, the company sent out a geologist and oil expert to make investigations, with the result that oil was discovered.

Three wells are now in operation and others are to be opened.—From "The Lamp.."

BIDS CALLED FOR CONSTRUCTION OF HIGHWAY SYSTEM IN CUBA

Bids for construction of the Cuban Central Highway system have been called for by the Department of Public Works of the Cuban Government, according to a cable to the Department of Commerce from Commercial Attache Todd at Havana. This project is the largest road construction program south of the Rio Grande.

Dade County—F. A. Project 41—Finished Base Course.

Road Eight—Project 696—St. Lucie County.

The Why of the Highways

Editorial—The Toledo (Ohio) Blade

COMING upon an old map of Ohio and noting how the Indian trails were marked upon it we were persuaded to look up the dictionary definition of "highways." This was it: "Such a thoroughfare is termed a highway as distinguished from a private way or a turnpike toll-road, because of its being dedicated by grant of record or appropriated by Legislative Act to the free and absolute use of the public forever; a high form of easement in the law."

This may do very well to describe the highway to a court that wants to be precise and technical. But it doesn't provide the simple clues to the origin of the word. The Ohio map we mention does this.

It shows aboriginal trails crossing east and west, running north and south from about where Defiance now stands to the Ohio river near Wheeling. All of these trails in some part and one or two in their entire length touched the streams at head-waters. That is, the paths kept as nearly as possible to the ridges. They avoided the damper lowlands where they could. Here the Indian had the driest walking, the least obstruction from trees and underbrush, a way that was coolest in summer and freest of snow in winter, an outlook upon the country around him. The trails were highways in the sense that they were physically high. We know that the white men made use of the Indian trails. We know, too, that in several counties of Ohio the first purely white men's roads were ridge roads, marked out for purposes identical with those of the Indians who made trails. There was no thought of what the law would say of such roads. But there was much thought about keeping out of the swamps. A high road meant easy going.

All primitive people have very much the same instincts. It is probably that the earliest roads of England were along the ridges, that they were kept high out of bog and thick forest and that, as time went on, they were designated as the most important roads, being in fact high ways and highways.

The Relation of Improved Highways to Education

The following composition was written by Rassie Littleton, who finished the high school course in the Choudrant High School, Choudrant, La., during the past Spring:

EDUCATION and Good Roads are so intimately related that it is almost impossible to consider one without making definite plans for the other. No community can plan the education of its future citizens without, at the same time, planning the construction of good roads. Neither can there be improved highways without the citizens being educated concerning the value and need of good highways.

Not long since it was a long and laborious walk to the one-room, poorly-equipped schoolhouse with its overworked, underpaid teacher. At present we are beginning to realize the benefits of good roads in connection with education. Throughout our state we see hundreds of children being transported to our modern and thoroughly-equipped high schools, there to be instructed by thoroughly-trained teachers. The roads and conveyance are such that pupils are transported regardless of weather conditions, so that their work is not disturbed by irregular attendance.

The above is not a mere statement, but is a plain statement of facts. To cite an example in my own case: I live five miles from my high school which distance five years ago was a long and laborious route to travel, almost impassable at times. Now, with improved roads, it takes less than thirty minutes to deliver a truckload of pupils to a modern high school, housed in one of the most modern buildings.

We have access to lyceums and other forms of educational entertainments, given by people specially trained in their field of endeavor. Having good roads we are able to reach and attend these educational entertainments, which, without improved highways, would not be possible.

One of the State institutions of learning is thirteen miles from my home. By having good roads, my brother is able to go to college, driving from home each morning. A large percent of the pupils attending this state college, drive in from distances varying from a few miles to as far away as twenty-five or thirty miles. And, furthermore, many of these pupils could not have the advantage of a college education except for the good roads which permit them to live at home while attending school. Another advantage

Project 40-E—Road Four

of this situation is that pupils attend college and spend their hours out of school under the supervision of their own parents and home influence.

Formerly higher education was almost wholly for the wealthier, while with improved highways any boy or girl with the ambition may pursue training in the higher fields of learning. Improved highways has still another boon to offer in the way of education for our elders—we now have many evening schools, attended by hundreds of fathers and mothers. This, of course, would not be possible except for our good highways.

In connection with the possibilities for education afforded by good roads, I have in mind two instances where mothers have attended college and received their diplomas at the same time as their daughters received theirs.

Shakespeare tells us "Home-keeping have ever homely wits"; and another writer has said, "Travel is the most nearly painless instrument of education." With the advent of good roads, we herald the end of painful and tiresome travel over rough roads; and we appreciate the fact that we are able to travel in comfort more than we do the possible loss of "Homely wits."

If I may be permitted to refer to instances in my own experience, I call to mind where it has been possible, with improved highways, to attend a most excellent lecture, attend a specially good picture, take advantage of a chatauqua program, and an extra good musical concert. Remember these things would not have been possible without improved highways.

Good highways have had much to do in breaking down the vast differences formerly existing between rural and city people. In years to come this difference will all but disappear, since access to all parts of the country or cities is so easy and rapid.—Louisiana Highway Magazine.

SAFETY LAST

Lies sleeping here one William Lake; he heard the bell, but had no brake.—Detroit News.

Here he sleeps, one Johnny Fonker; he rounded a turn without a honker.—Scranton Scrantonian.

Down in the creek sleeps Jerry Bass; the bridge was narrow; he tried to pass.—Wilkes-Barre Times-Leader.

Beneath this stone sleeps William Raines; ice on the hill; he had no chains.—Harrisburg Telegraph.

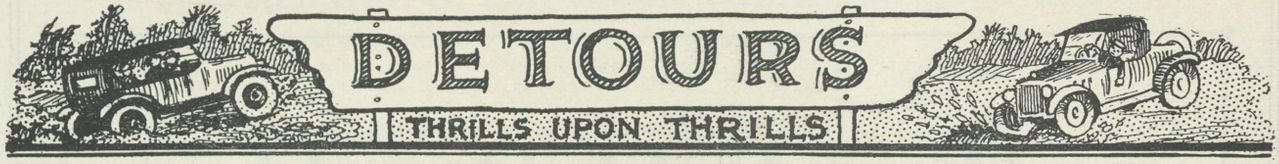
Here lies the body of William Jay, who died maintaining his right-of-way.—Boston Transcript.

And here's what's left of Samuel Small; he paid no attention to "slow" signs a-tall.—Capper's Weekly.

Here lies all that's left of Harry; at the railroad crossing he did not tarry.—Railway Life.

John William Jones lies under this thistle; he didn't heed the choo-choo's whistle.—Railroad Data (New York.)

We could stop short skirts in about twenty years by teaching present girl babies to walk too soon.—Tacoma Times.



Seeing America First

Mention Niagara Falls, Yellowstone Park or the Grand Canyon to the flivver owner who drove his car across the continent, and he will probably recall having heard those names before. Ask him what he saw on his tour, and he will describe it to the last detail:

The place where gas was thirty-eight cents a gallon.
The polite traffic cop.
The thirty-four detours.
The weather for twenty consecutive days.
The mudhole he avoided.
The mudhole he did not avoid.
The eighteen cars he saw from his home State.
The hill where he passed an "eight."
The hot-dog vendor who short-changed him fifteen cents.
The rusty nail that caused his one puncture.
The other good driver he saw on the road.—Pacific Coast Motorist.

Using His Head

Pensacola, Fla.—George Barnes, State inspector of sea foods, stuck his head into a barrel of crabs, and came out with one on his lip and another on his chin. Friends pried him loose.

Beating Him to It

According to a contemporary, one of our novelists has a suit for every day of the week. That's nothing. We have one for every day of the year; we're wearing it now.—The Humorist.

Then Warm It in the Ice Box

After an hour rinse thoroughly in warm water in which a large lump of soda has been dissolved, afterward boiling thoroughly in cold water.—Omaha paper.

Ike, Jr.—"Papa, give me a nickel for an ice-cream cone, I'm so warm now."
Ike, Sr.—"Come to papa, Ikey, and I'll tell you some ghost stories which will make your blood run cold."—Ex.

After wondering thousands of years how to fix their hair, women finally decided to cut it off.—Norfolk Post.

"I am no Bolshevist," declares Mussolini. Or, as the stenographers would put it, "Dictator, but not Red."—Border Cities Star (Windsor).

Spick-and-Span

Visitor—"And how old is your baby, dear?"
Small Sister—"He isn't old at all. He's a this year's model."—Christian Register.

Jack and Jill
Sped up a hill,
A curve up there was sharp,
The car upset,
Jack's rolling yet;
Jill's playing on a harp.

"Going to get married?"
"Yep, in the winter."
"How do you know?"
"He said it would be a damn cold day when we married."

"When I was in China I saw a woman hanging from a tree."
"Shanghai?"
"Oh, about six feet."

"Are you driving your car with a last year's license?"
"No you saphead, with gasoline."

Alas! rich relatives are usually distant relatives or close relatives.—Birmingham News.

A man who never touches meat, alcohol or tobacco recently celebrated his seventy-fifth birthday. But how?—The Passing Show.

Postponement Pays

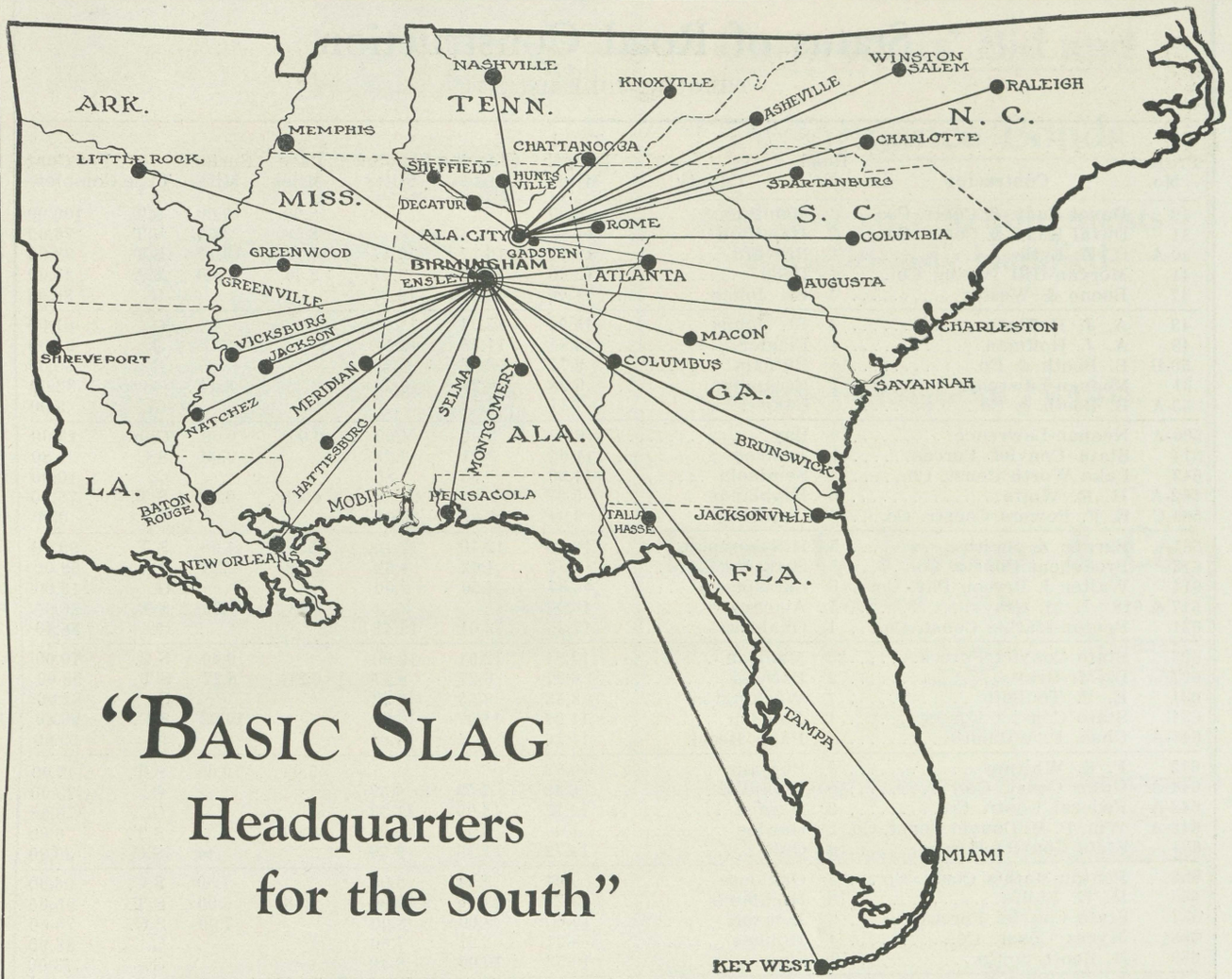
Sparks—"If you know who stole your car, why don't you go get it back?"
Larks—"I'm waiting for him to paint it."—Life.

Not to Be Caught

Witty Boarder—"Ah, your steak is like the weather this evening, Madam, rather raw."
Witty Landlady—"Indeed? By the way, your account is like the weather, too, unsettled."—Forbes Epigrams.

Another thing holding up the return of a good five-cent cigar is the return of a good five cents.—El Paso Times.

Mr. Hoover says we have recovered from the war, but doesn't say what.—Detroit News.



"Basic Slag Headquarters for the South"

THE South's Headquarters for scientifically prepared Basic Slag are our four immense plants at Birmingham, Alabama City, Bessemer and Ensley, Ala.

These plants have a combined daily capacity of 6,300 tons. During 1924, and again in 1925, more than a million tons were used in concrete buildings, bridges, railroad ballast, built-up roofs and in all types of hard-surface pavements.

This large tonnage—made possible by the ideal geographical location of these plants and our ability to consistently quote favorable delivered prices to all Southeast points—lends new meaning to that time-honored phrase:

"Basic Slag Headquarters for the South."

Birmingham Slag Co.

Slag Headquarters for the South

ATLANTA
THOMASVILLE

Birmingham

MONTGOMERY
OCALA, FLA.

"ENSLEY" & "ALA CITY"
BASIC SLAG
CRUSHED & SCREENED

Status of Road Construction

THROUGH JULY 31st, 1926

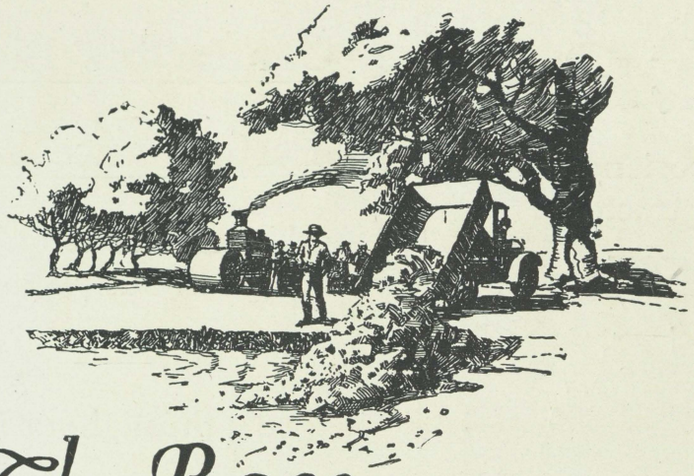
Project No.	Contractor	Road No.	County	Total Length Miles	Clearing Miles	Grading Miles	Base Miles	Surface Miles	Type	Per Cent Complete
19	Duval Engr. & Contr. Co.	2	Hamilton	8.20			8.20	8.20	S.T.	100.00
31	Duval Engr. & Contr. Co.	2	Hamilton	11.82			8.98	0.00	S.T.	76.00
40-A	C. F. Lytle	4	Brevard	16.17	16.17	16.17	16.17	16.17	S.T.	99.00
41	Morgan-Hill Paving Co.	4	Dade	12.00	10.78	9.41	2.35	0.00	S.A.	38.00
47	Boone & Wester	4	St. Johns	14.96	13.47	12.87			G.	88.00
48	A. J. Hoffman	4	St. Johns	15.94	15.94	11.95			G.	81.00
49	A. J. Hoffman	4	Flagler	13.81	11.75	2.76			G.	31.00
50-B	B. Booth & Co.	14	Putnam	9.77	8.42	6.40			G.	65.00
51	Noonan-Lawrence	7	Escambia	6.28	6.28	5.34		5.34	Conc.	82.00
53-A	B. Booth & Co.	2	Lake	7.11	2.13	.50			G.	9.00
500-A	Noonan-Lawrence	20	Bay	9.65	7.00	4.00	0.00	0.00	Conc.	15.00
514	State Convict Forces	1	Jackson	11.04	3.31	3.31		0.00	S.C.	27.80
543	Lake Worth Const. Co.	3	Seminole	14.20	.85	.85			G.	10.00
562-A	H. E. Wolfe	8	Highlands	5.37			4.43	0.00	S.T.	75.00
564-C	E. F. Powers Constr. Co.	5	Charlotte	3.94	0.00	0.00			G.	0.00
581	Barnes & Smith	5	Hillsborough	12.10	12.10	12.10	12.10	11.00	S.T.	99.00
613	Broadbent Constr. Co.	5	Sarasota	4.62	4.62	4.62	4.62	.28	S.A.	69.00
614	Walter J. Bryson Pav. Co.	5	Sarasota	17.07	4.50	2.00			G.	13.00
617 & 618	L. M. Gray	5	Alachua	16.07			6.43	0.00	S.T.	36.00
621	Penton-Mathis Const. Co.	1	Okaloosa	17.35	13.01	10.41			G.	58.40
623	State Convict Forces	35	Madison	12.91	12.91	12.00		0.00	S.C.	70.00
627	L. M. Gray	2	Putnam	6.27	6.27	6.27	6.27	6.27	S.T.	99.00
631	E. P. Toulmin	1	Washington	8.53	8.53	6.82			G.	82.00
634	State Convict Forces	1	Jackson	11.07	11.07	10.96		10.52	S.C.	90.80
641-A	Chas. F. Wilmore	4	Palm Beach	11.36	9.35	4.01			G.	29.00
642	F. S. Whitney	3	Putnam	10.82			5.09	0.00	S.T.	45.00
644-A	Gillis Const. Co.	10	Wakulla	8.49	7.59	6.59			G.	75.00
648-A	Federal Contr. Co.	2	Hardee	14.17	13.00	11.33			G.	78.00
648-A	Wm. P. McDonald Const. Co.	2	Hardee	1.00	0.00	0.00	0.00	0.00	S.T.	0.00
651	State Convict Forces	10	Gulf	14.72	11.78	9.56		.44	S.C.	30.80
652	Penton-Mathis Const. Co.	33	Okaloosa	9.04	9.04	9.04		7.00	S.C.	96.00
655	H. E. Wolfe	18	Highlands	13.26	13.26	12.60	8.88	0.00	S.T.	95.00
657	State Convict Forces	6	Jackson	10.00	9.00	8.00		7.00	S.C.	75.00
658	Myers Const. Co.	1	Holmes	8.21	8.21	7.60			G.	88.00
660	B. Booth & Co.	3	Clay	10.52	10.09	8.42			G.	73.00
661	Sou. Paving Const. Co.	2	Lake	3.52	3.52	3.52	3.52	3.00	S.A.	98.70
663	Taylor Contr. Co.	5	Citrus	8.03	8.03	7.64			G.	97.20
666	State Convict Forces	6	Jackson	6.52	6.52	6.52		6.00	S.A.	95.00
668	E. F. Powers Const. Co.	4	Brevard	13.45	0.00	0.00			G.	0.00
669-B	M. C. Winterburn, Inc.	27	Dade	10.32	10.32	10.32	0.00	0.00	S.T.	75.00
670	State Convict Forces	6	Jackson	12.30	12.30	10.00		9.00	S.C.	75.00
672	State Convict Forces	1	Leon	9.92	9.92	8.93		4.96	S.C.	89.00
673	State Convict Forces	1	Gadsden	9.90	7.00	6.00		0.00	S.C.	55.00
675	Wm. P. McDonald Const. Co.	17	Polk	5.16	5.06	3.61	0.00	0.00	S.A.	16.00
676-A	Gilbert & Hadsock	19	Levy	9.95	6.47	2.69			G.	33.00
676-B	McLeod Const. Co.	19	Levy	14.39	10.65	4.89			G.	37.00
679	Taylor Contr. Co.	5	Hernando	7.12	7.12	6.84			G.	93.90
682	Caye-Andrews Co. Inc.	5	Citrus	6.46	6.46	5.17			G.	86.00
693	Boone & Wester	4	St. Lucie	8.73	8.38	3.05			G.	17.00
694	C. A. Steed & Sons	4	Martin	8.48	5.51	2.04			G.	11.60
Total Complete July 31st, 1926				1568.91	1616.50	638.18	1212.85			
Complete month of July, 1926				35.80	39.36	15.26	20.82			
Total Complete June 30th, 1926				1533.11	1477.14	622.92	1192.03			

TOTAL MILEAGE COMPLETE

	Concrete	Brick	B.C.	S.A.	B.M.	Asp. Blk.	S.T.	S.C.	Marl	Total
Complete to June 30, 1926	111.20	17.15	10.74	63.16	89.07	23.20	456.11	453.28	34.86	1269.77
Complete month of July	2.45			2.31			11.64	6.42		22.82
Total to July 31, 1926	113.65	17.15	10.74	65.47	89.07	23.20	467.75	459.60	45.86	1291.59

Note—The above tabulation shows only those projects that are actually under construction at the present time and does not show projects that have been previously completed. However, the table, "Total miles completed," at the foot includes all projects that have been completed prior to July 31, 1926, and the amounts completed in July also. The abbreviations are as follows:

C.—Concrete. S.A.—Sheet asphalt. B.M.—Bituminous macadam. R.—Rock base. S.C.—Sand clay. G. & D.—Graded and drained. S.T.—Surface treated. B.C.—Bituminous concrete.



The Base is the Life of a Highway

THE best of surfaces roll and rut if spread on an uncertain base. Money, labor, time and surface material represent a constant drain on the community purse—unless the foundation is sturdy against the grind and shock of steady traffic.

Eight inches of Lime Rock, graded for proper drainage, make a marvelous base. Some of the foremost testing laboratories for road materials give Lime Rock their best credentials, and the Federal Bureau of Highways approves it for use on roads which the Government builds. These facts alone are influencing officials and communities throughout Florida to specify Lime Rock.

Loaded trucks and hurrying passenger cars constantly challenge the best of surfaces, but experience has shown unusual strength and durability in Lime Rock, for there is a compactness about this material developed in its use. Lime Rock is spread as a watered mixture. Its chemical characteristics are such that a part dissolves and under the roller the mass becomes a solid, smooth, resilient foundation which cushions the shocks of traffic and stoutly resists the wear and tear of speed as transmitted through the surface.

Engineers and road builders are quick to recognize the cost-reducing features of Lime Rock. But low cost alone is no economy. Lasting qualities are the first consideration, and when durability is coupled with convenient sources of supply and moderate price, Lime Rock rises to a high place in the opinion of experts.

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